

NAVAL HEALTH RESEARCH CENTER

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ABSTRACT

Objective

The present study was designed to describe the prevalence of dietary supplement use, including androstenedione, ephedrine, and creatine, in a population of active-duty US Marines.

Method

Participants completed a self-report questionnaire that was designed to assess behavioral and health factors in Marines stationed at Camp Pendleton, CA.

Results

Fifty-four percent of the 1482 participants had used dietary supplements in the preceding year. Of the individuals who consumed supplements, 684 (87%) provided detailed information regarding the type of supplement they used. Among supplement users, 443 (65%) consumed multiple supplements and 145 (21%) consumed at least 4 supplements. The most commonly used type of dietary supplement was muscle mass/strength aids (53%) followed by energy boosters (28%) and vitamins/minerals (27%). Of the specific supplements investigated, 350 (51%) of the supplement users consumed a supplement that contained ephedrine, 260 (38%) consumed creatine, and 75 (11%) individuals consumed androstenedione in the previous year.

Conclusions

The level of dietary supplement use in this population requires further investigation due to the reported adverse effects of some of these products. Future studies are needed to determine the prevalence of use as well as the determinants of use in a variety of populations.

INTRODUCTION

The use of dietary supplements is a key component of complementary and alternative medicine. The use of dietary supplements has risen dramatically in recent years, motivated not only by attempts to manage a variety of conditions, but also to improve physical performance and general health. The US federal government allows for the marketing of any substance that affects the structure or function of the body as a dietary supplement without regulation. However, the manufacturers must state on product labels that the product has not been evaluated by the Food and Drug Administration and the product is not intended to diagnose, treat, or prevent disease. Despite the increase in dietary supplement use, little is known about the patterns of use in specific populations. The majority of studies have focused on the frequency of supplement use in older populations^{1,2} or have focused strictly on vitamin and mineral supplements.^{1,3,4} Young, healthy individuals often consume dietary supplements to improve physical performance and increase muscle mass. This is most common among athletes^{5,6} and among individuals with demanding physical occupations.⁷

The present study was designed to describe the prevalence of dietary supplement use, including androstenedione, ephedrine, and creatine, in a population of active-duty US Marine Corps personnel.

METHODS

The Marine Health Behavior Survey was an anonymous self-report questionnaire designed to assess behavioral and health factors in Marines stationed at Camp Pendleton, Calif. Six Marine units were selected to represent major commands at Camp Pendleton including the First Force Service Support Group and the First Marine Division. Surveys were administered in large groups in November 2000 to men and women with various pay grades, job duties, and levels of educational attainment. A total of 1482 questionnaires were collected from 1696 potential individuals available for the study, yielding a participation rate of 87%. Of the 1482 surveys, 13 were excluded because of noncompliance with survey instructions and 19 were excluded because they did not answer

questions to determine dietary supplement use, thus resulting in 1450 surveys for the study.

Dietary supplement use was defined as the use of any over-the-counter dietary supplement for the purpose of increasing physical fitness, health, or well being in the year prior to the survey date. For descriptive purposes, supplements were categorized into stimulants (e.g., caffeine pills, ephedrine), muscle mass/strength aids (e.g., protein formulas, creatine), weight loss, energy boosters (carbohydrate gels, food bars), mood/mental ability aids (e.g., kava kava, St. John's Wort), vitamins/minerals, or other substances used for general health (e.g., ginseng, echinacea) by study participants. These categories are based on the purpose of consumption as marketed by the manufacturer and not on the ingredients of the supplement.

RESULTS

Demographics of the participants, by supplement use, are presented in Table 1. Fifty-four percent of the participants had used dietary supplements in the proceeding year. There were no differences in the mean age (23 years), ethnicity, or marital status for supplement users versus non-users; however, there was a significantly higher proportion of women and higher educational status in the supplement users group. Of the individuals who consumed supplements, 684 (87%) provided detailed information regarding the type of supplement they used (Table 2). Among supplement users, 443 (65%) consumed more than one supplement and 145 (21%) consumed at least 4 supplements. The most commonly used type of dietary supplement was muscle mass/strength aids (53%) followed by energy boosters (28%) and vitamins/minerals (27%). Of the specific supplements investigated, 75 (11%) of the supplement users consumed a supplement that contained androstenedione, 260 (38%) consumed creatine, and 350 (51%) individuals consumed ephedrine in the previous year.

DISCUSSION

This study documents a high rate of dietary supplement use in healthy young men and women. Over half of the participants reported use of at least one dietary supplement and nearly a third reported the use of two or more supplements. Weight/strength gain

supplements were the most commonly used, followed by energy boosters and vitamins/minerals. Supplements containing androstenedione, creatine, and ephedrine were also common. There are only a few published studies which have investigated the overall spectrum of dietary supplement use, including ergogenic products used to increase physical fitness.^{7,8} Despite the fact that these studies were conducted in specialized populations undergoing intense physical training, such as military special force candidates⁷ and new military recruits,⁸ this study documents a markedly higher use of androstenedione and creatine.

This level of dietary supplement use in a healthy, young, non-training population is of concern, due to the reported adverse effects of these products. Androstenedione, for example, is hypothesized to increase the risk of gynecomastia,⁹ cardiovascular disease,¹⁰ breast cancer in women,¹¹ and prostate cancer in men.¹² Ephedrine has been associated with tremor, headache,¹³ adverse cardiovascular conditions,^{14,15} and even death.^{13,14,16} Additional studies are needed to determine the prevalence and determinants of dietary supplement use as well as adverse reactions, in order to better educate these populations.

REFERENCES

1. Newman V, Rock C, Faerber S, Flatt SW, Wright FA, Pierce JP. Dietary supplement use in women at risk for breast cancer recurrence. *J Am Diet Assoc.* 1998;98(3):285-292.
2. Lyle BJ, Mares-Perlman JA, Klein BEK, Klein R, Greger JL. Supplement users differ from nonusers in demographic, lifestyle, dietary and health characteristics. *J Nutr.* 1998;128(12):2355-2362.
3. Balluz LS, Kieszak SM, Philen RM, Mulinare J. Vitamin and mineral supplement use in the United States. *Arch Fam Med.* 2000;9:258-262.
4. Bender MM, Levy AS, Schucker RA, Yetley EA. Trends in prevalence and magnitude of vitamin and mineral usage and correlation with health status. *J Am Diet Assoc.* 1992;92:1096-1101.
5. Bucci LR. Selected herbals and human exercise performance. *American Journal of Clinical Nutrition.* 2000;72(suppl 2):S624-S636.
6. Wolfe RR. Protein supplements and exercise. *American Journal of Clinical Nutrition.* 2000;72 (suppl 2):S551-S557.
7. Arsenault J, Kennedy J. Dietary supplement use in US Army Special Operations candidates. *Mil Med.* 1999;164(7):495-501.
8. Stephens MB, Olsen C. Ergogenic supplements and health risk behaviors. *J Fam Pract.* 2001;50(8):696-699.
9. Phillips GB, Pinkernell BH, Jing TY. The association of hyperestrogenemia with coronary thrombosis in men. *Arterioscler Thromb Vasc Biol.* 1996;16:1383-1387.
10. Cauley JA, Lucas FL, Kuller LH, Stone K, Browner W, Cummings SR. Elevated serum estradiol and testosterone concentrations are associated with a high risk for breast cancer: Study of Osteoporotic Fractures Research Group. *Ann Intern Med.* 1999;130:270-277.
11. Gyssas I, Syrigos KN, Konstandoulakis MM. Sex hormone levels in the serum of patients with pancreatic adenocarcinoma. *Hormone and Metabolic Research.* 1997;29:115-118.
12. Barrett-Connor E, Garland C, McPhillips JB, Khaw KT, Wingard DL. A prospective population-based study of androstenedione, estrogens, and prostate cancer. *Cancer Res.* 1990;50:169-173.
13. Centers for Disease Control and Prevention. Adverse events associated with ephedrine-containing products-Texas, December 1993-September 1995. *MMWR Morb Mort Wkly Rep.* 1996;45(32):689-693.
14. Haller CA, Benowitz NL. Adverse cardiovascular and central nervous system events associated with dietary supplements containing ephedra alkaloids. *N Engl J Med.* 2000;343(25):1833-1838.
15. Zaacks SM, Klein L, Tan CD, Rodriguez ER, Leikin JB. Hypersensitivity myocarditis associated with ephedra use. *Clin Toxicol.* 1999;37(4):485-489.
16. Theoharides T. Sudden death of a healthy college student related to ephedrine toxicity from a ma huang containing drink. *J Clin Psychopharmacol.* 1997;17(5):437-439.

Table 1. Characteristics of 785 Dietary Supplement Users and 665 Non-users From the Marine Health Behavior Survey

| Characteristics | Supplement Use n (%) | No Supplement Use n (%) | P-Value |
|---|-------------------------|----------------------------|---------|
| Age, y (n = 1444) | | | 0.496 |
| < 20 | 114 (14.5) | 106 (16.1) | |
| 20-25 | 538 (68.6) | 444 (67.3) | |
| 26-34 | 96 (12.2) | 88 (13.3) | |
| ≥ 35 | 36 (4.6) | 22 (3.3) | |
| Sex (n = 1446) | | | 0.007 |
| Men | 703 (89.9) | 623 (93.8) | |
| Women | 79 (10.1) | 41 (6.2) | |
| Ethnicity (n = 1427) | | | 0.607 |
| Non-Hispanic White | 444 (57.7) | 362 (55.1) | |
| African-American | 84 (10.9) | 86 (13.1) | |
| Hispanic | 188 (24.4) | 156 (23.7) | |
| Asian/Pacific Islander/ American Indian/Alaska Native | 20 (2.6) | 17 (2.6) | |
| Education (n = 1445) | | | 0.001 |
| High school or less | 490 (62.6) | 465 (70.2) | |
| Technical school/some college | 240 (30.7) | 178 (26.8) | |
| College degree or beyond | 52 (6.7) | 20 (3.1) | |
| Marital status (n = 1449) | | | 0.853 |
| Single | 484 (61.7) | 412 (62.0) | |
| Married | 248 (31.6) | 212 (31.9) | |
| Other | 53 (6.7) | 40 (6.1) | |

Table 2. The frequency of use of selected dietary supplements for 684 dietary supplement users from the Marine Health Behavior Survey.

| Supplement Type | Frequency (%) |
|---------------------------|----------------------|
| Stimulants | 167 (24.4) |
| Muscle mass/strength aids | 363 (53.1) |
| Weight loss | 177 (25.9) |
| Energy boosters | 190 (27.8) |
| Mood/mental ability aids | 25 (3.7) |
| Vitamins/minerals | 186 (27.2) |
| General health | 62 (9.1) |

REPORT DOCUMENTATION PAGE

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13. SUPPLEMENTARY NOTES

14. ABSTRACT (maximum 200 words)

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